UNITED STATES DEPARTMENT OF COMMERCE
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NATIONAL MARINE FISHERIES SERVICE

Northwest and Alaska Fisheries Center
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CRUISE RESULTS
NOAA R/V CHAPMAN
CRUISE CH-84-04
R/V ALASKA
AK 84-01

EASTERN BERING SEA CRAB GROUNDFISH SURVEY

CRUISE PERIOD

NOAA R/V CHAPMAN 5 JUNE 1984-27 AUGUST 1984
R/V ALASKA 5 JUNE 1984-12 AUGUST 1984

Itinerary

The NOAA research vessel CHAPMAN departed Kodiak, Alaska on 5 June 1984 to begin the first leg of its portion of the eastern Bering Sea crab-groundfish survey. Intervening port calls were made to Dutch Harbor, AK to load equipment and exchange scientific personnel on 27 June, 17 July, and 7 August. Fishing operations were conducted on 55.5 days; 13 days were spent in transit; 5 days were lost to weather, and 7.5 days were spent in port. The cruise terminated in Dutch Harbor on 27 August 1984.

The chartered vessel ALASKA departed Kodiak on 5 June 1984 and port calls were made to Dutch Harbor on 27 June and 17 July to exchange scientific personnel. A total of 45 days were spent conducting fishing operations; 10 days were spent in transit; 8.5 days were lost to weather, and 3.5 days were spent in port. The survey terminated on 12 August 1984 in Dutch Harbor.

Area Surveyed

The survey area covered eastern Bering Sea continental shelf waters from Unimak Pass north along the 100-fathom contour line to approximately 61°N latitude and east to the Alaska mainland. The study region encompassed the major distributional area of commercially important demersal fish and shellfish stocks. Trawling stations were uniformally established on the basis of the standard 20 x 20 nautical mile grid (1 station per 400 nm^2) that has been used in earlier Bering Sea surveys (Figures 1 and 2). Station density was increased around St. Matthew and the Pribilof Islands to provide greater sampling of blue king crab stocks of those areas.

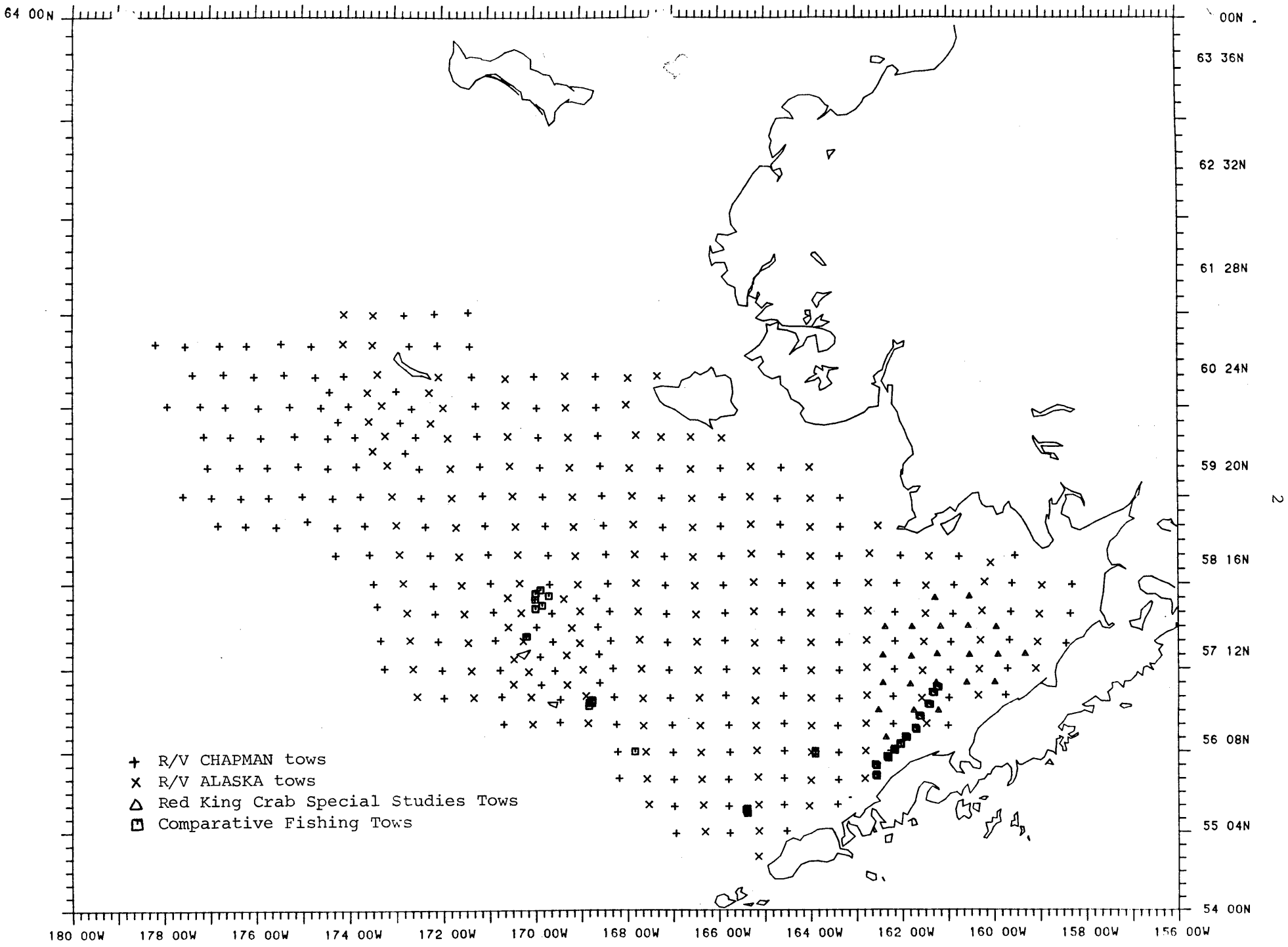


Figure 1.-- Successfully trawled survey stations, red king crab special studies tows and comparative fishing tows completed during the 1984 eastern Bering Sea crab-groundfish survey.

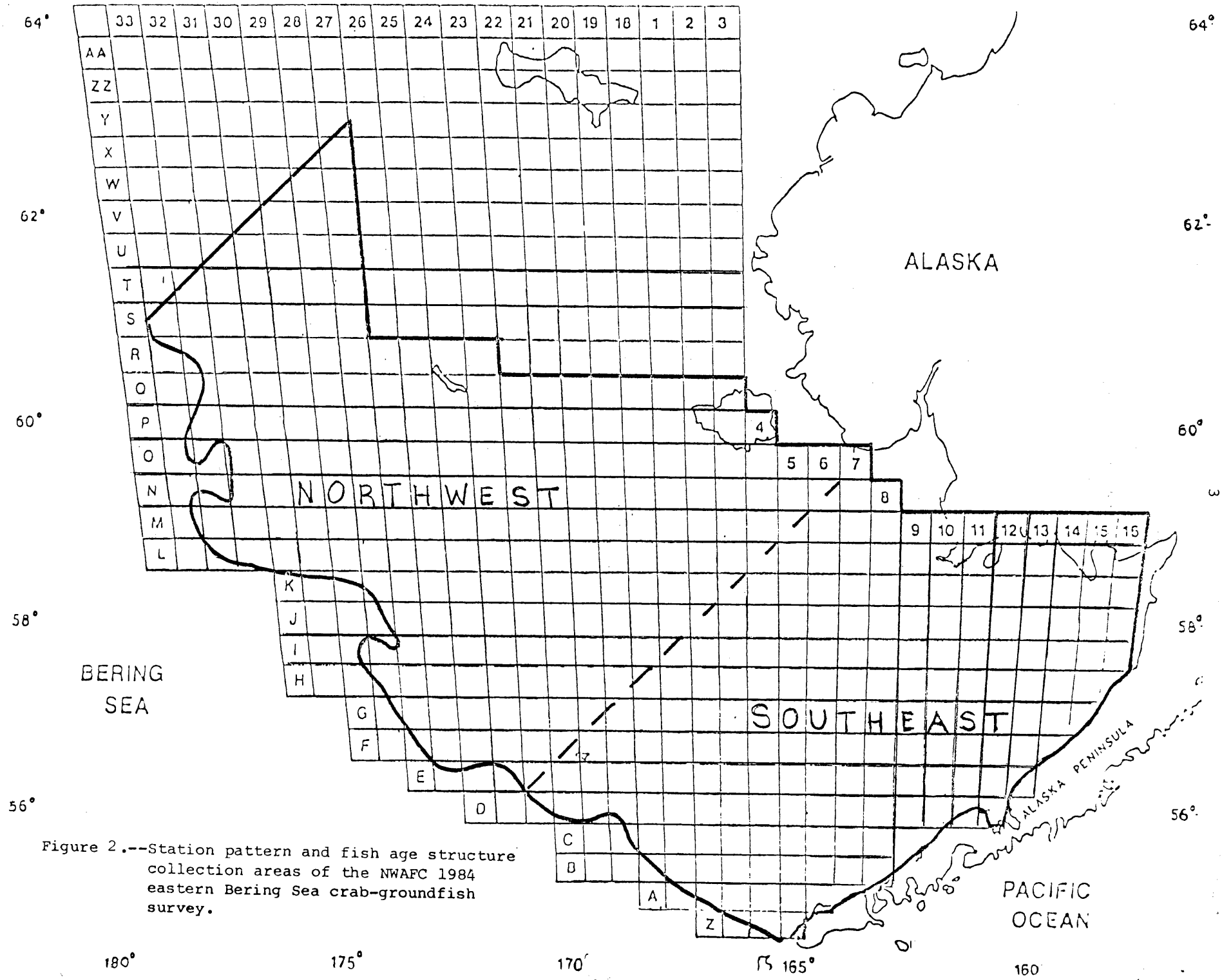


Figure 2.--Station pattern and fish age structure collection areas of the NWAFC 1984 eastern Bering Sea crab-groundfish survey.

Primary Objectives

The primary objectives of the survey were to:

1. continue the annual series of assessment surveys of crab and groundfish in the eastern Bering Sea through the collection of abundance and biological data on crab and groundfish species in the described shelf survey area;

2. collect seawater temperature and salinity data using CSTD (conductivity, salinity, temperature, depth) equipment at all stations trawled by the CHAPMAN and collect temperature data using XBT (expendable bathythermograph temperature) probes and surface bucket thermometers at all stations trawled by the ALASKA;

3. conduct side-by-side fishing experiments between the CHAPMAN and the ALASKA to compare current and previously used trawl and rigging arrangements.

Secondary Objectives

Other objectives were to:

1. record observations of spawning groundfish;

2. collect stomach samples from major designated fish species for RACE-REFM's cooperative trophic interactions study;

3. collect specimens of flathead sole/Bering flounder and arrowtooth flounder/Kamchatka flounder for biochemical genetic studies;

4. collect designated specimens of groundfish for the Observer Training Program;

5. collect Greenland turbot specimens for: a) study of flesh quality by the Utilization Research Division and b) parasitic studies conducted by Polish scientists;

6. collect juvenile Pacific halibut specimens for parasite studies by the International Pacific Halibut Commission (IPHC);

7. participate with the IPHC in tagging and releasing Pacific halibut for stock movement studies;

8. collect designated fish and squid specimens for energy content analysis by the National Marine Mammal Laboratory (NMML) and,

9. continue Pacific cod tagging studies.

Gear

The modified 83-112 otter trawl was used at all survey stations occupied by the CHAPMAN and the ALASKA. Gear configurations for the modified and standard 83-112 otter trawls are shown in Figures 3 and 4.

83/112 EASTERN

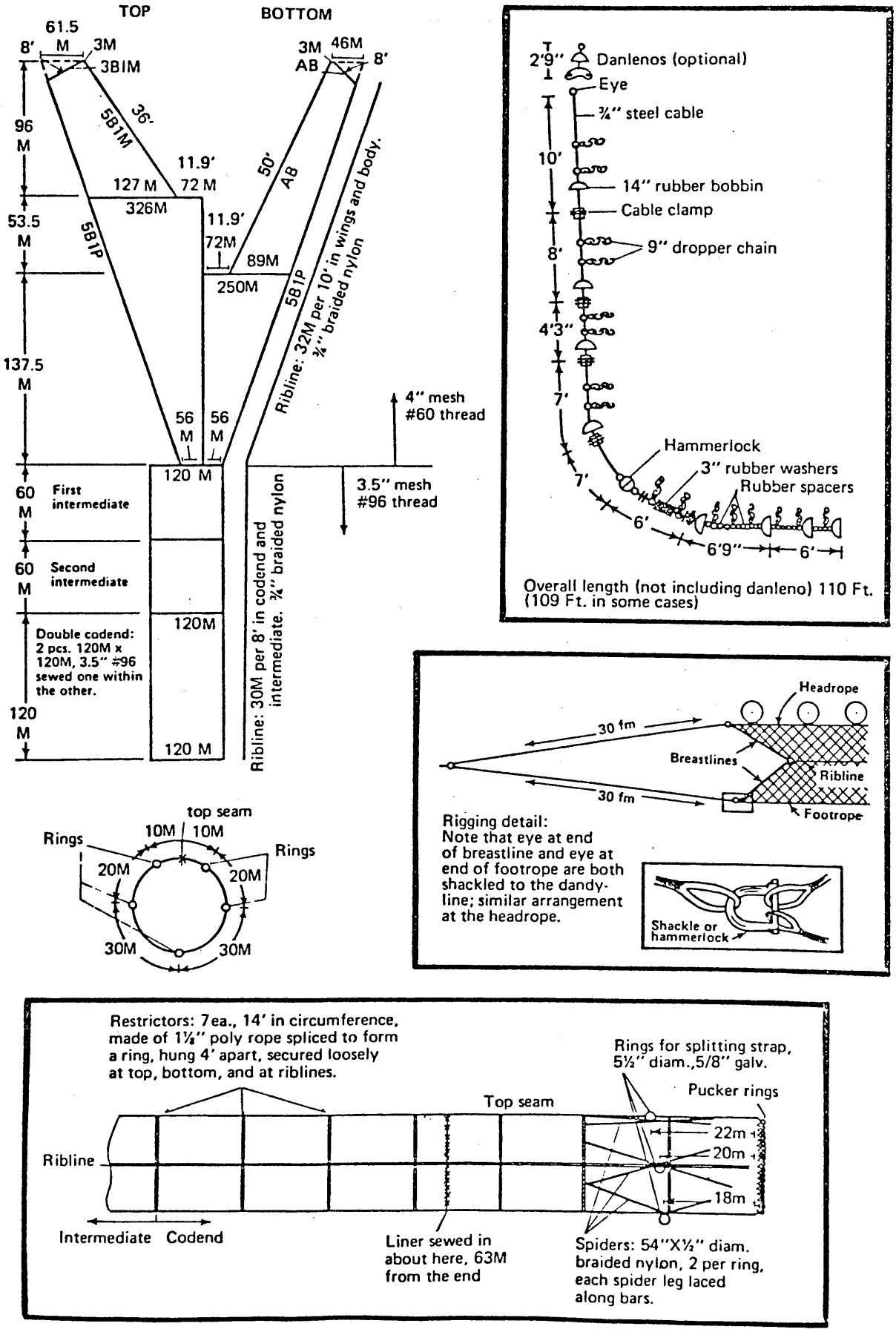


Figure 3.--Diagram of the 83-112 eastern trawl.

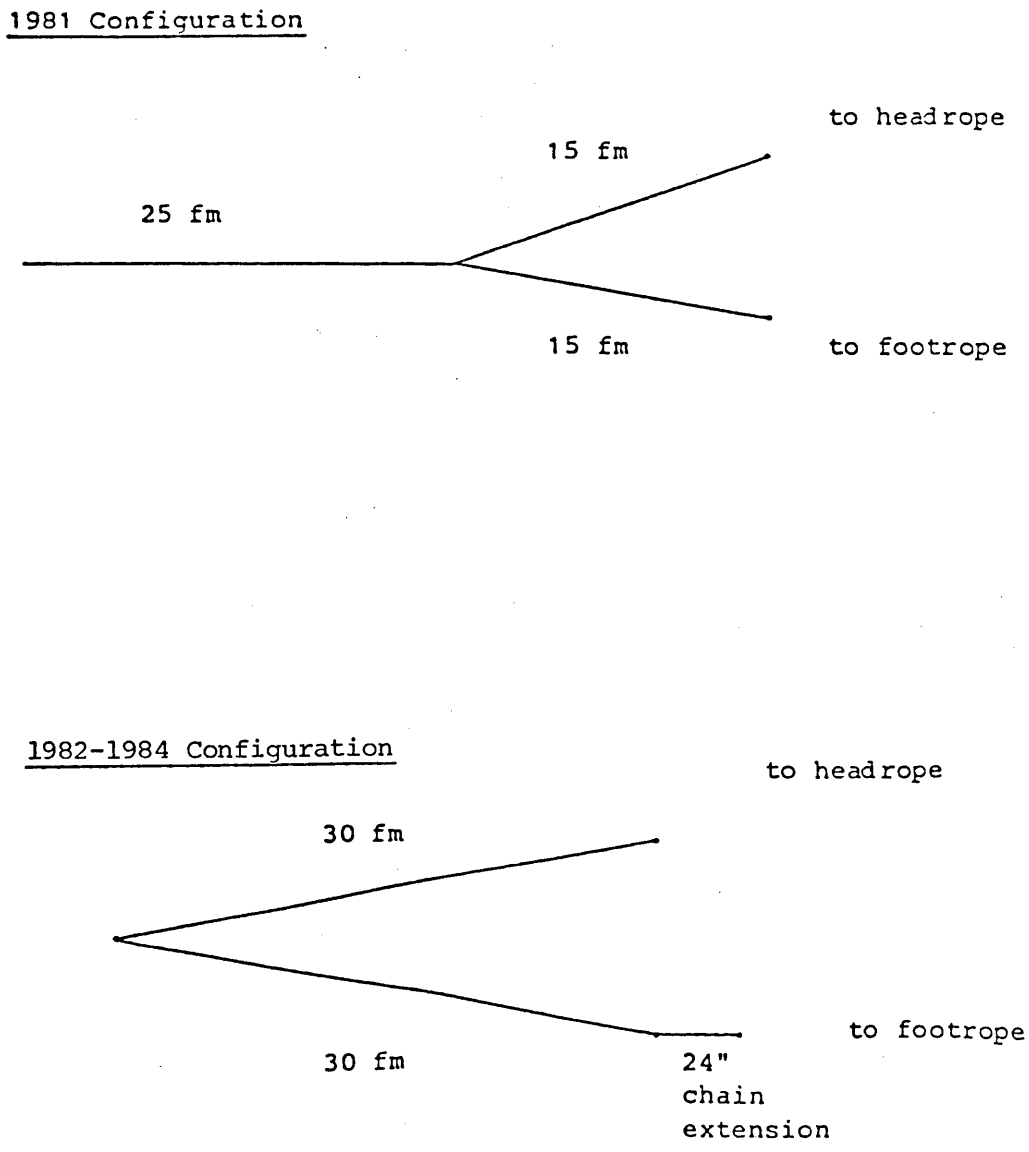


Figure 4.--Dandyline gear configuration for the 83-112 eastern trawl as used in 1981 and 1982-84.

The modifications were intially made to improve the net's bottom-tending characteristics during the 1982 crab-groundfish survey. These modifications included altering the dandyline configuration and placing 24-inch chain extensions between each end of the footrope and lower dandylines.

The modified 83-112 had a 112' footrope and 83' headrope with 4" mesh in the wings and body, 3-1/2" mesh in the intermediate, and 1-1/2" mesh in the codend liner. There were 41 floats on the headrope. The mean effective path width was approximately 54 ft. for both vessels.

The 400-mesh eastern trawl (Figure 5) which was the standard crab-groundfish survey trawl in most years prior to 1982 and was last used by the ALASKA during the 1981 crab-groundfish survey was used in the gear comparison experiment. The 400-mesh eastern trawl had a 94' footrope and 71' headrope, 4" mesh in the wings and body, 3-1/2" mesh in the intermediate and codend with 1-1/4" mesh in the codend liner. It had 15 floats on the headrope.

Methods

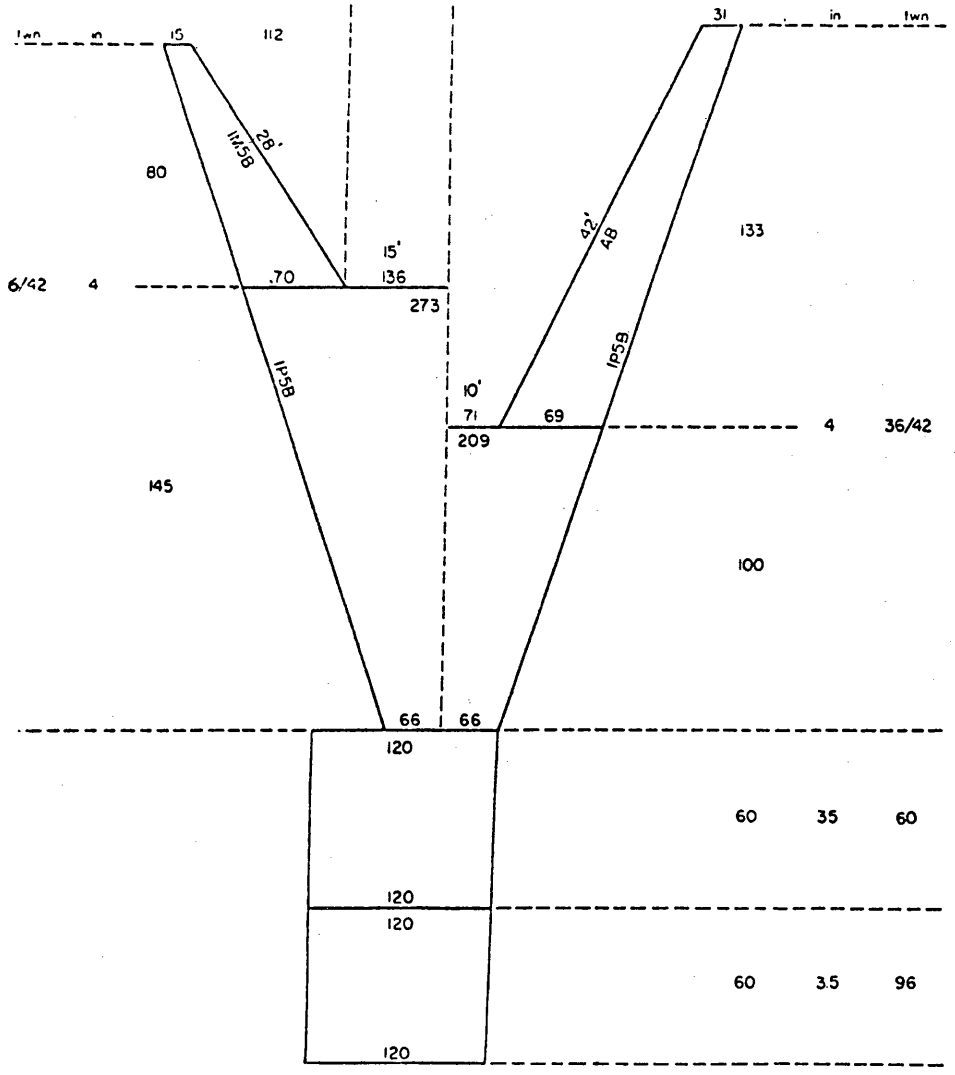
Standard sampling methods were the same as used in previous years. A 30 minute bottom trawl haul was conducted at each station. Surface and bottom water temperatures were taken at each station using CSTD's on the CHAPMAN, and XBT probes and bucket thermometers on the ALASKA.

Catches weighing less than approxitmately 2,500 lb. were entirely sorted and processed. Catches weighing more than the 2,500 lb. capacity of the sorting table were subsampled. However, all specimens of commercially important species of crab and Pacific halibut were removed from every catch. After the catch or subsampled portion of the catch was sorted into baskets, all species or species groups were weighed, enumerated and either discarded overboard or saved for subsequent biological sampling.

Additional biological collections included size composition by sex and age structures from:

Pollock (*Theragra chalcogramma*)
Yellowfin sole (*Limanda aspera*)
Rock sole (*Lepidopsetta bilineata*)
Pacific halibut (*Hippoglossus stenolepis*)
Pacific cod (*Gadus Macrocephalus*)
Sablefish (*Anoplopoma fimbria*)
Pacific herring (*Clupea harengus pallasi*)
Arrowtooth flounder (*Atheresthes stomias*)
Alaska plaice (*Pleuronectes quadrituberculatus*)
Greenland turbot (*Reinhardtius hippoglossoides*)
Flathead sole (*Hippoglossoides elassodon*)

For king and tanner crab, total weights and numbers in the catch were determined. All individuals were measured when the crab catch was small. A representative subsample, or approximately 300 crabs, was processed from very large crab catches. In addition to carapace measurements, shell condition,



Headrope:
71 ft of 3/8", 6 x 19 galvanized wire rope wrapped with 3/8" polypropylene rope.

Footrope:
94 ft, 1/2", 6 x 19 galvanized wire rope wrapped with 9/16" polypropylene rope.

Breastlines:
6 ft, 1/4" proof coil galvanized chain.

Footrope weight:
1/4", proof coil galvanized chain, 112.5 ft long (9 links per 7-1/2" hanging).

Flotation:
15 pieces, 8" diameter floats (5.5 lbs buoyancy = 82.5 lbs) evenly spaced.

Codend liner:
1-1/4" mesh, No. 18 nylon; 340 meshes around, 240 meshes deep, secured 15 meshes up from bottom of intermediate (leave about 2 ft of liner extending from end of bag).

Otterboards:
5 x 7 ft V-doors - 820-850 lbs each.

Figure 5. -- Diagram of the 400-mesh eastern demersal trawl.

clutch size, and egg condition were also recorded. Tanner crabs were examined for the presence of "blackmat" disease.

Two age structure collection areas (southeast and northwest) were established (Figure 2) to examine differences in age composition and growth rates of selected fish species by region. Otoliths were stored and recorded individually to allow for comparisons with fishery age data and to examine short term growth.

Otoliths collected from roundfish species were stored in 50% ethyl alcohol and those collected from flatfish species were stored clean and dry. Dorsal spines were collected from Pacific cod; and spines were frozen for later preparation and analysis. Scales were collected from Pacific herring and stored in 50% alcohol.

The CHAPMAN and ALASKA fished alternate north-south rows of standard stations providing data for comparison of relative fishing powers between the two vessels (Figure 1).

After the completion of all standard survey stations, gear comparison studies were conducted between the CHAPMAN and ALASKA. The gear comparison study consisted of two parts: 1) to obtain additional data in comparing the 83-112 eastern trawl (CHAPMAN) and the 400-mesh eastern trawl (ALASKA) as used in 1981 and earlier crab-groundfish surveys, and 2) to obtain data on the relative efficiencies of the modified 83-112 trawl as rigged in 1982-84 compared to the rigging used prior to 1982.

Results

A total of 485 tows were attempted during the survey period, of these, 385 were succcessful standard survey stations, 80 were comparative tows for gear comparison studies, and 23 tows were made in Bristol Bay for additional assessment studies of Red King Crab.

Table 1 lists the biological data and specimen collections during the 1984 crab-groundfish survey. Approximately 157,000 length measurements were taken from major fish species and approximately 5,600 age structures collected. Four hundred specimens of arrowtooth flounder/Kamchatka flounder and flathead sole/Bering flounder were collected for genetic studies and approximately 2,500 stomachs were collected for trophic studies. Approximately 1,000 Pacific cod and Pacific halibut were tagged and released.

Table 2 ranks the twenty most abundant fish species (kg/ha) taken during the 1984 survey. As in previous years, walleye pollock, yellowfish sole, and Pacific cod were the most abundant fish species in the survey area.

Preliminary analysis of fishing efficiencies between the two vessels based on the alternate row fishing during the standard survey indicated that the ALASKA was more efficient than the CHAPMAN in catching yellowfin sole, flathead sole, rock sole, poachers, squid, and shrimp. The CHAPMAN was more effective in capturing sablefish than the ALASKA. Results of the comparative fishing experiments between the 1982-84 rigged 83-112 trawl and the earlier rigged 83-112 trawl and between the 1982-84 rigged trawl and the 400-mesh eastern trawl have not been analyzed.

Table 1.--Collections of biological data and samples during the 1984 eastern Bering Sea crab-groundfish survey.

Species	Length measurements	Length weight	Maturity	Stomach scans	Age structures[1/]	Whole specimens	Stomachs	Ovaries
Pollock	40,530		337	140	1,695			14
Pacific cod	13,733	33			689		564	
Sablefish	53							
Yellowfin sole	38,385				820		786	
Rock sole	22,261				462			
Flathead sole/ Bering flounder	17,735				573	200	611	
Pacific halibut	1,591					50		
Alaska plaice	14,448				455			
Arrowtooth flounder/ Kamchatka flounder	7,510				355	200	566	
Greenland turbot	536				263	38	21	
Rex sole	96							
Pacific herring	296				302			
Arctic cod	51							
Northern rockfish	117		117					
Total	157,342	33	454	140	5,614	488	2,548	14

[1/] Dorsal spines were collected from Pacific cod and scales were collected from Pacific herring. Otoliths were collected from all other species.

Table 2--Rank order of abundance of the 20 most abundant fish taxa taken during the 1984 eastern Bering Sea crab/groundfish survey.

Rank	Species	CPUE (kg/ha)
1	Walleye pollock	98.70
2	Yellowfin sole	72.44
3	Pacific cod	21.52
4	Rock sole	20.82
5	Alaska plaice	15.64
6	Flathead sole/Bering flounder	7.28
7	Arrowtooth flounder/Kamchatka flounder	3.94
8	Pacific halibut	1.94
9	Skate unidentified	1.92
10	Alaska skate	1.88
11	Sablefish	1.32
12	Plain sculpin	1.04
13	Butterfly sculpin	0.83
14	Myoxocephalus verrucosus	0.76
15	Longhead dab	0.61
16	Yellow Irish lord	0.60
17	Bigmouth sculpin	0.55
18	Sparse toothed lycod	0.46
19	Great sculpin	0.39
20	Greenland turbot	0.39

PERSONNEL

CHAPMAN

Leg I, June 5-June 26

Name	Title	Organization *
1. Sample, T.	Chief Scientist***	NWAFC/S
2. Wincker,D.	Fish. Biologist	NWAFC/S
3. Anderson, P.	Fish. Biologist	NWAFC/K
4. Baxter, R.	Fish. Biologist	NWAFC/K
5. Blood,C.	Fish. Biologist	IPHC/S
6. Morado,J.	Fish. Biologist	NWAFC/S

Leg II, June 28-July 16

1. June,J.	Chief Scientist***	NWAFC/S
2. Shaw,F.	Fish. Biologist	NWAFC/S
3. Turner,M.	Fish. Biologist	NWAFC/S
4. Kessler,D.	Fish. Biologist	NWAFC/K
5. Baxter,R.	Fish. Biologist	NWAFC/K
6. Morado,J.	Fish. Biologist	NWAFC/S

Leg III, July 18-August 6

1. Armetta,T.	Chief Scientist ***	NWAFC/K
2. Wilkins,M.	Fish. Biologist	NWAFC/S
3. Livingston,P.	Fish. Biologist	NWAFC/S
4. Turner,M.	Fish. Biologist	NWAFC/K
5. Bryant,V.	Fish. Biologist	NWAFC/K

Leg IV, August 8-August 27

1. June,J.	Chief Scientist***	NWAFC/S
2. Fisk,D.	Fish. Biologist	NWAFC/S
3. Turner,M.	Fish. Biologist	NWAFC/S
4. Anderson,P.	Fish. Biologist	NWAFC/K
5. Cronk,K.	Fish. Biologist	NWAFC/K

R/V ALASKA

Leg I, June 5-June 26

1. Coe,J.	Chief Scientist***	NWAFC/S
2. Bohle,M.	Fish. Biologist	NWAFC/S
3. Hartsock,F.	Fish. Biologist	NWAFC/K
4. Dick,M.	Fish. Biologist	NWAFC/K
5. Price,R.	Fish. Biologist	IPHC/S

R/V ALASKA cont'd

Leg II, June 28-July 16

Name	Title	Organization
1. Umeda,Y.	Chief Scientist***	NWAFC/S
2. Halliday,K.	Fish. Biologist	NWAFC/S
3. Yang,M.	Fish. Biologist	NWAFC/S
4. Munk,E.	Fish. Biologist	NWAFC/K
5. Dick,M.	Fish. Biologist	NWAFC/K

Leg III, July 18-August 12

1. Shimada,A.	Chief Scientist***	NWAFC/S
2. Bohle,M.	Fish. Biologist	NWAFC/S
3. McPhail,M.	Fish. Biologist	NWAFC/S
4. Stevens,B.	Fish. Biologist	NWAFC/K

*K= Kodiak Laboratory
S= Northwest and Alaska Fisheries Center, Seattle